

Can we forecast the climate of the next decade?

Walker Institute research

Decadal predictions – the economic and social benefits could be immense

Imagine the benefits of being able to forecast the climate for the next one or even two decades.

Water companies would be able to plan and prepare better for drought or flooding. Retail companies might be able to capitalise on new markets if they thought there was more likelihood of hot, dry summers for example. The insurance sector would gain more accurate information about weather and climate risks. The examples are endless and the potential economic and social benefits immense.



Water management is one sector where decadal forecasts would be particularly useful.

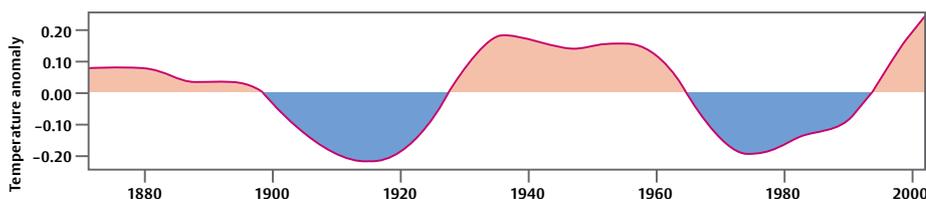
Understanding the climate system

Europe is one area where our research is showing real potential for decadal forecasts because of the long term memory that exists in the North Atlantic Ocean.

The temperature of the North Atlantic varies naturally from colder to warmer periods over several decades. Work at the Walker Institute shows that these natural cycles are linked to changes in ocean circulation and that they influence climate over Europe and the U.S.

Potentially, we can measure the state of the Atlantic and use this information to tell us about the climate of Europe over the next 10 to 20 years. This gives us the basis for a decadal forecasting system. In practice, decadal forecasts are probabilistic in nature. They give an indication of the chance of warmer or wetter conditions, for example.

North Atlantic temperature



Natural swings between warm and cold conditions in the North Atlantic are linked to a huge overturning circulation known as the thermohaline circulation or Atlantic conveyor belt. These fluctuations can affect the climate of Europe and other areas.

The climate of Europe over the next 20 years depends, to some extent, on the state of the Atlantic Ocean now. This gives the potential for decadal forecasts, but climate change also needs to be factored in.



To generate the most accurate forecasts of climate for the next 10 or 20 years we need to take into account both the current state of the climate (the initial conditions) and increasing greenhouse gases.

How does the North Atlantic affect climate?

The changing temperature of the North Atlantic affects climate over Europe, the U.S. and further afield. For example, we saw a rapid switch to a warmer North Atlantic in the 1990s and research suggests that this is increasing the chances of wet summers over the UK and hot, dry summers around the Mediterranean – a situation that is likely to persist for as long as the North Atlantic remains in a warm phase.

There is also evidence that a warm North Atlantic can be associated with decreased summer precipitation, increased drought risk and warmer temperatures in the U.S. and an increase in the frequency of Atlantic hurricanes.

A transition back to a cooler North Atlantic, favouring drier summers in the UK and northern Europe, is likely and could occur rapidly. Exactly when this will happen is difficult to predict, but is an area of active research.

What about human-induced climate change?

How will increasing greenhouse gases affect these naturally occurring variations in the North Atlantic? How do these naturally occurring cycles affect our forecasts of global warming?

Predictions of man-made climate change to date have ignored information about the current state of the climate system (or initial conditions). These predictions focus on longer timescales – looking out to 2050 or 2100 – by which time the influence of present climate conditions is no longer important.

Research at the Walker Institute is focusing on predicting climate for 10 to 20 years ahead. It is these time scales that are particularly relevant to business and government when considering how to adapt to a changing climate.

Our research shows that to forecast the climate for the next 10 or 20 years, we need to consider both increasing greenhouse gases and the present state of the North Atlantic and other aspects of the climate system. To characterise the present state of the climate system, and hence improve decadal predictions, we are combining Earth observations with our climate models to better reproduce the evolution of the earth system.

i For more information, please contact:

Kathy Maskell

Walker Institute
Communications Manager
University of Reading
Agriculture Building
Earley Gate
Reading RG6 6AR, UK

k.maskell@reading.ac.uk
Tel +44 (0)118 378 7380

www.walker-institute.ac.uk

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The research is led by:

Prof Rowan Sutton

Dr Ed Hawkins

National Centre for Atmospheric Science - Climate Directorate
and Department of Meteorology

Contact **Dr Ed Hawkins**

e.hawkins@reading.ac.uk